

Dear Peter Landschützer,

Please find below the answer to the reviewer's comments, that have been fully implemented in the revised manuscript. We thank you and the reviewers for the time spent on our manuscript.

Best regards,
Laurie Menviel

Menviel et al. modified their manuscript following comments from two reviewers. Their responses are clear and they have made the requested changes. Comparisons between simulated air-sea CO₂ fluxes and the SAM index and observation-based products are now more honest in highlighting the strengths and weaknesses of their simulations. Therefore, I believe that this paper will likely be a significant contribution and reach the quality standards for publication in the Biogeosciences journal after two technical corrections of the manuscript.

Minor comments:

1. The authors mentioned in their response that the "re-invigoration only lasts until 2003 in the simulation, while it lasts until 2010 in both observational datasets". But in the abstract, it says "while a reinvigoration is simulated between 2000 and 2012". Could the authors please correct the abstract?

The abstract has now been modified to: "Notably, two stagnations in tCO₂ uptake are simulated: between 1982 and 2000, and between 2003 and 2011, while re-invigorations are simulated between 2000 and 2003, as well as since 2012."

2. The correlation between a two-year average SAM and nCO₂ to suggest a "memory effect" is unclear. I'm not sure this is the right way to perform this analysis and support this claim. Instead, I would expect to get the results of a cross-correlation. If the results of a cross-correlation are not significant, I suggest removing this analysis from the manuscript. Furthermore, this claim is not discussed in the section "4 Discussion and conclusions".

This point was removed from the text. The figure S5 was modified so as to show the detrended fluxes versus the detrended SAM. The correlation coefficients were also amended in the main text.